IN THE SPECIFICATION:

Please amend the paragraph beginning at page 2 line 12 as follows:

A1

These systems **10** also include computing means to implement such features as conference calling **20**, voice mail **22** and toll services **24**. Telephony features, such as call forwarding, may be implemented by adding code to the programs running the switches **12** or by adding specialized hardware to the telephony ~~network~~ system **10**. The features available to particular users are defined in databases accessed by the switch **12** software, and adding a new type of feature may involve changing these databases together with all of the switch **12** software that uses them, and may also involve purchasing and installing new types of hardware in the network. Specialized software is also used to check the consistency of the features assigned to a particular user. For example, call-waiting and call-forward-on-busy features define different behaviours for the same event, a busy receiver; so both features may not be assigned to a user simultaneously.

Please amend the two paragraphs beginning at page 3 line 17 as follows:

A2

Changes to existing telecommunication networks **10** are therefore very complicated to make. There is a rigid model and hardware structure is difficult to extend. Therefore, existing ~~telcos~~ telephone companies ~~can not~~ cannot offer new features such as high quality voice. As well, even if offered, existing ~~telco's~~ telephone companies take a long time to bring such features to market.

The complexity of present telecommunications systems software, and the extensive interactions between its software components, makes the development of new features very difficult. As well, ~~telecomm~~ telecommunication services have traditionally been provided by large monopolies ~~who~~ that employed proprietary equipment that only they had access to. Another complexity is that new services had to be backward compatible to handle their existing ~~clientel~~ clientele.

Please amend the paragraph beginning at page 3 line 30 as follows:

A3

Traditional ~~telecomm~~ telecommunication does not consider differentiation, but focuses on provision of single services. Therefore, ~~telecomm~~ telecommunication providers would not be encouraged to offer varied services at a cost reduction to users, for example, reduced quality of voice telephony on Christmas Day, simply to provide additional connections or reduced cost. As well, small niche markets have gone completely unserved ~~completely~~ as the cost of developing and implementing the additional products does not net sufficient profits.

Please amend the five paragraphs beginning at page 4 line 8 as follows:

An application programming interface (API) converts a series of comparatively simple and high level functions into the lower level instructions necessary to execute those functions, simplifying use of an operating system. Using Windows™ APIs, for example, a program can open windows, files, and message boxes, as well as perform more complicated tasks, by executing single instructions. Windows™ has several classes of APIs that deal with telephony, messaging, and other communication issues.

These APIs can be implemented in Java™, which is a popular computer language enhanced by features that facilitate loading programs across the Internet and which can enforce strict rules that ensure that such programs do not contain software viruses that could interfere with the operation of the system to which they are downloaded. Java™ is also widely used for programming advanced graphical user interfaces (GUIs) such as those used on some Web pages, so that one skilled in the art can readily write a GUI that controls a telephony switch. A system known as JTAPI is an example of a Java™ Telephony API.

The TAPI consists of a large collection of specialized subroutine calls that allow a user to set up and tear down circuits connecting particular physical devices, including telephone sets and servers for functions such as voice-mail. It also allows the user to define how the system should respond to events such as hang-ups.

A system known as Parlay™ implements a telephony API that can be used to control the central office telephone switches owned by large telephone companies. This is similar in concept to the use of a telephony API to control a PBX, but security concerns are of prime concern because of the number of telephone users who would be inconvenienced by a failure.

Parlay™, TAPI, J-TAPI and similar systems permit third parties a degree of control over how telephone switches interconnect end users and specialized equipment such as voice-conferencing servers, but do not allow third parties to add new features such as encryption or voice coding. They are also unable to describe the handling of Internet traffic, and so it is necessary for a distinct system to be used to handle such functions as routing Internet browsing data through computers acting as security firewalls.

Please amend the paragraph beginning at page 6 line 6 as follows:

Part of the access network in these systems is usually a set of computer systems ~~38~~ 53 at the edge of the backbone network **36** which perform functions such as authentication of users and control of the load that they place on the backbone network **36**. Communications between users' computers ~~36~~ 38 and the rest of the network **36** are standardized by means of defined communications protocols.

Please amend the paragraph beginning at page 6 line 20 as follows:

#6

Socket mechanisms are widely used to describe connections between applications programs running on operating systems such as UNIX™ and Windows™. They can be used to set up connections between applications programs running on different computers, such that packets of data are passed between them across such networks as an Ethernet or the Internet. In Java™, for example, the expression 'new Socket("www.wireless-sys.com", 8888)' returns an object that represents a connection to "port 8888" on a computer on the Internet whose name is "www.wireless-sys.com". This object can be used with other Java™ methods to send data to, and receive data from, this computer. The "port number" is used by convention to define the type of data expected.

Please amend the paragraph beginning at page 7 line 1 as follows:

#7

Sockets typically use the Internet Protocol (IP) and can further be set up to use either the ~~Unreliable~~ User Datagram Protocol (UDP), which sends packets without checking to see if they have been received, or the Transport Control Protocol (TCP) which will retry until it receives a confirmation of receipt. Telephony applications typically use UDP, because data that does not arrive on time is of no value, while file transfer programs typically use TCP so that accurate delivery is assured. The user is generally required to choose between these two mechanisms to specify handling of error conditions in packet delivery or to write a new mechanism ab initio. Just as for telephony, it is difficult to add encryption or signal processing features to the handling of an IP stream.

Please amend the paragraph beginning at page 11 line 19 as follows:

#8

Real-time operating systems are operating systems where certain functions are required to be executed within certain time limits, giving the user the perception of continuous operation. In voice communication for example, users will not generally accept~~able~~ total unidirectional time delays, referred to as latencies, of greater than 200 milliseconds. Therefore, total execution time of all functions that affect the voice signal will have to be executed in less than 200 milliseconds.

Please amend the two paragraphs beginning at page 11 line 33 as follows:

#9

Firstly, the dominant ~~telecomm~~ telecommunications providers have been slow to stray from their vast PSTN infrastructures, which were not thought suitable for open systems. Because outside users are not able to access and modify the PSTN, they are limited to the functionality that the PSTN system provides. However, as the existing PSTN is in fact a real-time system, the invention does not alter the PSTN itself, but sends it a stream of data encapsulated as PSTN packets, which can traverse the PSTN network. Access to the PSTN is controlled by means of proxies, and ~~enabling~~ enabled by the use of gateways.

A9 cont

Existing ~~telecomm~~ telecommunications providers seek to continue use of their intelligent network (IN) and advanced intelligent network (AIN) services because of their enormous investments in the hardware and software to provide these services. The invention does not have to address integration with these systems because it is far easier to simply create new software to provide the same services. However, it is preferred that the operating system of the invention include SS7 stacks that allow user processes to control it and interact with it.

Please amend the paragraph beginning at page 12 line 32 as follows:

A10

The real-time functionality allows the use of audio, video and voice signals to be transported with sufficient speed to be comfortable to users. Many existing telecommunications systems, particularly those employing the Internet as a communications medium, suffer from serious quality problems including ~~chatter~~ jitter and lost packets. The invention provides a means for maintaining quality of service in transmission over such networks. This will be described in greater detail hereinafter.

Please amend the five paragraphs beginning at page 16 line 3 as follows:

A11

It is desirable that connections, whether for telephony, data, or new applications, survive the failure of the individual ~~computers~~ nodes and links that implement them. This can be implemented automatically by having the system reroute links on failure, as is done now for telephony and Internet connections, or by having the various proxies, described below, that originally built the connection rebuild it on failure. If the nodes on which the proxies themselves are running fail, they should be reinstantiated on functioning nodes. Techniques known in the art of database technology can be used to ensure that the proxies are able to recover enough of their state to be able to continue, for example, by storing program state on redundant nodes at programmer-defined checkpoints.

At step **78**, the data packet is then received at ~~its~~ a destination and is decoded. This step will include, of course, removing extraneous headers or encapsulation protocol data, to obtain the signal data from the packet. This data must then be synchronized and coordinated with other received data packets in accordance with the time stamp. As described above, the time stamp and synchronization may be performed in a number of manners.

At step **80**, the determination is made as to whether the data packet has arrived at its final destination. If not, control returns to repeat steps **76** and **78** until the network or networks have been traversed by the data packet.

At step **82**, the ~~components~~ nodes in the network then update, in real-time, their respective tables of load schedules for nodes and paths in the network. This is done so that each ~~component~~ node has the necessary data to manage the system load balancing and fault tolerance, which are described hereinafter with respect to steps **84** through **98** of **Figure 5B**. This updating is shown as a finite step in a sequence, but is expected that it will be updated periodically, or even in real-time.

A 11 Cont

A valuable function of distributed operating systems is load balancing: the system assigns new tasks to lightly loaded ~~processors~~ nodes and moves tasks around (dynamic load balancing) as loads change with time. In general-purpose computing the physical location of files is also considered when balancing computing loads so that network traffic does not become a bottleneck. For a telecom system these optimizations are also desirable, and it is preferred that the optimizations be extended to balance use of critical data transmission links. In a telecom access network that uses radio links and that permits double or multiple illumination of customer premises equipment, the choice of which of the two or several radio links to prefer should also be optimized as part of load balancing. Load balancing can be implemented by optimization methods known in the field of operations research.

Please amend the four paragraphs beginning at page 17 line 16 as follows:

A 12

In the preferred embodiment of the invention, it is intended that access to resources of the network be negotiated ~~in the manner described in the co-pending patent application under the Patent Cooperation Treaty, Serial No. _____, titled "Method and System for Negotiating Telecommunication Resources".~~

Therefore, at step **84** of **Figure 5B**, the system determines whether excessive loading has caused data quality to fall to an unacceptable level. It is preferred that this analysis be made at the ~~device~~ node closest to the receiving party that has the capability of making that determination. If for example, the receiving device is a personal computer with a telephony card, it may make this determination. However, if the receiving device is a simple telephone, it may not.

If it is determined that the quality is unacceptable, the system will make reference to the resource loading database at step **86**, so that ~~hand-offs~~ load shedding may be proposed and confirmed at step **88**. This shedding of loads may then be effected at step **90**, re-routing the communications that are bogging down the network.

In the preferred embodiment, the shedding of loads is managed by implementing a leaky bucket ~~load~~ traffic-shaping model. Leaky buckets are used both in ATM and RSVP to specify average bandwidth. Traffic is ~~modelled~~ modeled in terms of the average output rate and the size of the input buffer needed to smooth bursts out to that rate. A long burst will overflow the bucket, and packets that overflow the bucket are typically marked as candidates for deletion if the network overloads. For a radio link one might interpret these parameters literally, allocating enough radio slots/channels to handle the rate, and putting a buffer at the sending side. For an optical link it may be interpreted only as a specification that defines which packets may be marked for sacrifice.

Please amend the paragraph beginning at page 18 line 15 as follows:

#13

For coded voice, the average data rate is about 50% of the peak (this is also called the voice activity factor), but users would want to allocate enough bandwidth for the peak so that monologues don't get delayed in a buffer. The radio system still benefits from low voice activity, though, because interference is reduced. A model for 8kb/s coded voice might be a token bucket (don't delay data) with an input rate of 8kb/s, refilled with tokens at 5kb/s (a little margin over 50% utilization) and tens of seconds deep (so that it doesn't empty for 99% of speech bursts). The decision of how to handle data overruns depends on to desired voice quality and whether there is competing traffic, for example the price could go up, a lower-rate coder could be substituted, or a greater frame error rate (FER) accepted.

Please amend the paragraph beginning at page 19 line 11 as follows:

#14

When a fault is detected, reference is made to the resource loading database at step **94**, so that hand-offs may be proposed and confirmed at step **96**. As noted above, the resource loading database is updated in real-time with the negotiation of new communications, and completion of others. In the preferred embodiment, confirmation will be made with resource managers, or agents, who administer the loading of the network. These hand-offs may then be effected at step **98**, re-routing the effected communications through acceptable nodes and links.

Please amend the two paragraphs beginning at page 19 line 32 as follows:

#15

In the preferred embodiment of the invention, a NetPort **102** contains a simple computer **106** including one or more central processing unit or units and memory, a modem ~~**118**~~ **108**, radio circuitry and antenna ~~**120**~~ **110** necessary to implement the 3G link, and other components such as a power supply and user interface. The NetPort **102** will also contain the circuitry necessary to connect the computer **106** to a conventional telephone ~~**100**~~ **112** through an RJ-11 connector and circuitry necessary to connect the computer **106** to an Ethernet local area network (LAN) **114** through an RJ-45 connector.

An NPM **104** in the preferred embodiment contains: a high performance computer system including one or more ~~several~~ central processing units **116** and memory **117**, a modem **118** and radio circuitry and antennas **120** necessary to implement the 3G link and other components such as a power supply, user interface, and nonvolatile storage such as disk drives. An NPM **104** will also have circuitry necessary to connect the computer system to a backbone network or networks such as the Internet **124** or the public switched telephone network (PSTN) **126**.

Please amend the paragraph beginning at page 22 line 6 as follows:

A16

A particular type of process which may be started on a NetPort **102** or NPM **104** is ~~known~~ referred to by the present inventors as a Filter Runtime Environment (FRE), which operates as a node. This is a process ~~which~~ that can be used to run a collection of filters, which are described above. In one embodiment the filters are implemented as subroutines that are interconnected dynamically to allow an FRE to have a behaviour defined flexibly by the particular interconnection of filters that compose it: for example to apply tone controls, compress voice, then encrypt it for transmission and store a copy of the encrypted voice on voice-mail, and to cryptographically sign the resulting voice-mail as having originated from the claimed caller.

Please amend the paragraph beginning at page 24 line 20 as follows:

A17

The microprocessor preferably stores the operating system kernel in an internal memory cache, though this memory **134** may be off-processor as shown in **Figure 7**. This off-processor memory **134** is preferably a non-volatile memory such as an electrically erasable programmable read only memory (EEPROM) or FlashROM, but may also be a volatile memory such as a random access memory (RAM). This memory **134** may be used to store the desired digitization, encryption and protocol algorithms, which are downloaded via the wireless input/output. Because the operating system is distributed, it is not necessary to store much functionality in the cellular telephone **128**, but is preferable to store functions commonly required because of the resulting increases in processing speed.